

Appl. No. 10/694,013  
Amendment dated July 14, 2004  
Reply to Office Action of April 21, 2004

### *Interview Summary*

On July 7, 2004, the undersigned conducted a personal interview at the U.S. Patent Office with Examiner Hai Huynh, who is in charge of the above-identified patent application. Applicants wish to thank Examiner Hai Huynh for the opportunity to discuss the above-identified patent application during the Interview of July 7, 2004.

During the personal interview, the undersigned explain the deficiencies of the Sasaki et al. patent and the Ando et al. patent relative to independent claims 1, 15 and 16. In particular, as explained during the personal interview, the Sasaki et al. patent fails to disclose igniting an air-fuel mixture formed after a majority of the fuel stream is guided to an upper portion of the combustion chamber by the guide wall surface of the piston when the direct fuel injection engine is operating in a high-load stratified combustion region as recited in claims 1, 15 and 16. As explained during the personal interview, the Ando et al. patent fails to disclose igniting an air-fuel mixture formed directly after the fuel stream is injected into the combustion chamber and prior to a majority of the fuel stream being guided back towards the spark plug when the engine is operating in low-load stratified combustion region as recited in claims 15 and 16.

Examiner Hai Huynh agreed that the Sasaki et al. patent and the Ando et al. patent both fail to disclose the claimed invention as set forth in independent claims 1, 15 and 16.

### *Drawings*

In the Office Action Summary, the Office Action indicates that the drawings filed on October 28, 2003 have been approved. Applicant wishes to thank Examiner Hai Huynh for the approval of the drawings.

### *Claim for Priority Under 35 U.S.C. §119*

In the Office Action Summary, the Office Action indicates that no priority documents were received. However, on October 28, 2003, Applicants submitted certified copies of

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Japanese Application Nos. 2002-374874 and 2003-025914, to which this application claims priority under 35 U.S.C. §119. Proof of this filing of these priority documents is established by the attached postcard (Exhibit A) with the USPTO mailroom date stamp of October 28, 2003. Also attached is a copy of the Claims for Priority Under 35 U.S.C. §119 with the front pages of the certified copies of the priority documents (Exhibit B) that were filed with the application on October 28, 2003.

*Acknowledgement of the priority documents filed on October 28, 2003 is respectfully requested.*

***Rejections - 35 U.S.C. § 102***

In paragraphs 2 and 3 of the Office Action, claims 1-16 stand rejected under 35 U.S.C. §102 as being anticipated by U.S. Patent No.6,470,850 (Sasaki et al. patent), while claims 15 and 16 further stand rejected under 35 U.S.C. §102 as being anticipated by U.S. Patent No. 6,622,690 (Ando et al. patent). In response, Applicants respectfully traverse these rejections as explained during the interview and as repeated below.

Independent claims 1, 15 and 16 require a direct fuel injection engine or a method of operating a direct fuel injection engine in which the following conditions occur:

- (1) Igniting a first air-fuel mixture formed directly after the fuel stream is injected from the fuel injection valve and prior to a majority of the fuel stream being guided by the guide wall surface of the piston when the direct fuel injection engine is operating in a low-load stratified combustion region, and
- (2) Igniting a second air-fuel mixture formed after a majority of the fuel stream is guided to an upper portion of the combustion chamber by the guide wall surface of the piston when the direct fuel injection engine is operating in a high-load stratified combustion region.

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Clearly, the claimed invention as set forth in independent claims 1, 15 and 16 is *not* disclosed or suggested by either the Sasaki et al. patent or the Ando et al. patent. In particular, the Sasaki et al. patent fails to disclose at least condition (2) above, while the Ando et al. patent fails to disclose at least condition (1) above.

It is well settled under U.S. patent law that for a reference to anticipate a claim, the reference must disclose each and every element of the claim within the reference. Therefore, Applicants respectfully submit that independent claims 1, 15 and 16 are not anticipated by the prior art of record. Withdrawal of these rejections is respectfully requested.

More specifically, in Sasaki et al. patent, the Region II may be considered as a stratified combustion region. The Sasaki et al. patent discloses the fuel is ignited right after the second fuel injection is completed when in Region II. In particular, the Sasaki et al. patent states that the "air-fuel mixture gathers around the spark plug 7, therefore the air-fuel mixture is reliably ignited" (column 13, lines 18-200). Thus, in Region II, the stratified combustion is performed by forming a rich air-fuel mixture agglomerate in a lean air-fuel mixture. However, even though this Region II in the Sasaki et al. patent may correspond to the "high-load stratified combustion region" of the present invention, the Sasaki et al. patent does not disclose or suggest igniting the air fuel mixture "formed after a majority of the fuel stream is guided to an upper portion of the combustion chamber by the guide wall surface of the piston". From the description in column 9, line 64 – column 10, line 10, or column 13, line 15 to 36, in Region II of the Sasaki et al. patent, the fuel is ignited before the fuel injected in the second injection reaches the piston. Thus, the fuel injected by the first fuel injection may have reached to the piston, but this fuel would not be guided by the guide wall of the piston cavity toward the upper portion of the combustion chamber because the first fuel injection is performed during the intake stroke. In other words, the Sasaki et al. patent fails to disclose igniting an "air-fuel mixture formed *after a majority of the fuel stream is guided to*

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*an upper portion of the combustion chamber by the guide wall surface of the piston when the direct fuel injection engine is operating in a high-load stratified combustion region"* as recited in independent claims 1, 15 and 16.

Therefore, the Sasaki et al. patent does not disclose switching between two stratified combustion operations (i.e., one operation utilizing the guide wall of the piston, and another operation that does not utilize the guide wall of the piston) based on the engine load. In other words, the Sasaki et al. patent fails to disclose each and every element recited in claims 1-16 of the present invention.

Regarding the rejection to claims 15 and 16 based on the Ando et al. patent, an irregular four cycle operation (which includes two compression strokes and two expansion strokes in one cycle) when the engine load and speed are relatively low. However, as in the Sasaki et al. patent, the Ando et al. patent does not teach different controls within a stratified combustion region (i.e., the low-load and high-load stratified regions). In the irregular four cycle operation of the Ando et al. patent, two separate fuel injections are executed in one cycle. In particular, a first injection is executed during the compression stroke as seen in Figure 5(a), while a second injection is executed during the expansion stroke after the combustion (or during the second compression stroke) as seen in Figure 5(d). As seen in Figure 5(a) and Figure 5(d), neither the first nor the second injection is ignited directly after the fuel stream is injected from the fuel injection valve. More specifically, Figure 5(a) shows the fuel stream is guided by the cavity of the piston before the fuel stream is ignited. The second injection (Figure 5(d)) is mixed with the surrounding gas as seen in Figure 5(e) before it is combusted. In other words, among the two injections in the Ando et al. patent, only the fuel injected by the first injection will form a stratified air-fuel mixture as seen in Figure 5(b). Accordingly, the Ando et al. patent fails to disclose igniting a first fuel mixture formed *directly after the fuel stream is injected* into the combustion chamber and prior to a majority

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of the fuel stream being guided back towards the spark plug when the engine is operating in a *low-load stratified combustion region* as recited in claims 15 and 16.

Therefore, the Ando et al. patent does not disclose switching between two stratified combustion operations (i.e., one operation utilizing the guide wall of the piston, and another operation that does not utilize the guide wall of the piston) based on the engine load. In other words, the Ando et al. patent fails to disclose each and every element recited in claims 15 and 16 of the present invention.

Moreover, Applicants believe that the dependent 2-14 are also allowable over the prior art of record in that they depend from independent claim 1, and therefore are allowable for the reasons stated above. Also, the dependent claims 2-14 are further allowable because they include additional limitations. Thus, Applicants believe that since the prior art of record does not anticipate the independent claim 1, neither does the prior art anticipate the dependent claims 2-14.

Therefore, Applicants respectfully request that these rejections be withdrawn in view of the above comments.

#### *Prior Art Citation*

In the Office Action, additional prior art references were made of record. Applicants believe that these references do not render the claimed invention unpatentable whether taken alone or in combination.

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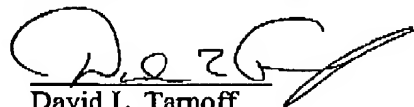
In view of the foregoing amendment and comments, Applicants respectfully assert that claims 1-16 are now in condition for allowance. Reexamination and reconsideration of the pending claims are respectfully requested.

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If there are any questions on this Response, please contact the undersigned.

Respectfully submitted,



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